

Amendments to the Claims

1. (Currently Amended) A cathode arc source for generating positive carbon ions from a cathode target, said ions being emitted in a direction substantially normal to a front surface of the target, comprising:

a cathode;

an anode;

a vacuum chamber; and

a macroparticle filter; and

a magnetic field generating means, wherein said magnetic field generating means is arranged to generate a magnetic field in the vacuum chamber, wherein the magnetic field has a direction substantially normal to the front surface of the target and zero field strength at a position above the target and inside the chamber, the magnetic field being the resultant of fields generated by a first field generating means located above the target and a second field generating means located below the target.

2. (Original) A source according to Claim 1 wherein an inner surface of the chamber is an anode.

3. (Currently Amended) A source according to Claim 2 wherein said magnetic field generating means comprises ~~comprising~~ means for generating a first magnetic field proximal to the target and having a first field direction and means for generating a second magnetic field distal from the target and having a field direction substantially opposite to that of the first magnetic field.

4. (Previously Presented) A source according to Claim 2 wherein:

at the front surface of the target, the field direction substantially normal to the front surface is towards the front surface;

magnetic field strength in said direction decreases with increasing distance from the target to a point of zero field strength substantially normal to the front surface; and

from said point of zero field strength, with increasing distance from the target, the field direction is away from the front surface of the target.

5. (Previously Presented) A source according to Claim 2 wherein:

at the front surface of the target, the field direction substantially normal to the front surface is away from the front surface and towards the substrate;

magnetic field strength in said direction decreases with increasing distance from the target to a point of zero field strength substantially normal to the front surface; and

from said point of zero field strength, with increasing distance from the target, the field direction is towards the front surface of the target.

6. (Currently Amended) A source according to Claim 2 wherein said magnetic field generating means comprises ~~comprising~~ means for generating a magnetic field which has a zero field strength in a direction substantially normal to the target and a lateral field strength of 15mT to 35mT.

7. (Previously Presented) A source according to Claim 2 wherein at the point of zero field strength in a direction substantially normal to the target, a field strength in a direction substantially lateral to the target is at least 10mT.

8. (Original) A source according to Claim 7 wherein the point of zero normal magnetic field is located between 2 and 6 cm above the surface of the target.

9. (Original) A source according to Claim 1 further comprising means for generating a radial electric field to focus positive ions generated from the source into a beam.

10. (Currently Amended) A cathode arc source comprising:

a cathode;

an anode;

a vacuum chamber;

a macroparticle filter;


a magnetic field generating means, wherein said magnetic field generating means is arranged to generate a magnetic field in the vacuum chamber;

a cathode station for location of a target in electrical contact with the cathode, said target having a front and a rear surface; and

means for striking an arc at the front surface of the target, wherein the magnetic field is located at the front surface of the target and wherein the magnetic field has a lateral field component effective to maintain the arc on the front surface of the target during operation and a normal field component with a direction substantially

normal to the front surface of the target and zero field strength at a position above the target and inside the chamber.

11. (Previously Presented) A method of striking an arc at a graphite cathode target in a vacuum chamber comprising:

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- (i) generating (a) below the target, a first magnetic field having a first field direction and (b) above the target, a second magnetic field having a second field direction opposite to that of the first, so as to generate a magnetic field that is resultant from the first and second fields, wherein said magnetic field has a direction substantially normal to a front surface of the target and zero field strength at a position above the target and inside the chamber; and
 - (ii) striking the arc in the resultant field.

12. (Original) A method according to claim 11 wherein the arc is struck between a cathode and an anode formed by an inner surface of the vacuum chamber.


13. (Original) A method according to claim 11 comprising varying coil current in means for generating the first or second magnetic fields so as to vary the resultant field to optimize arc striking.

14. (Previously Presented) A method according to claim 11 further comprising using the second magnetic field to steer plasma from the arc through a macroparticle filter.

15. (Original) A method according to claim 11 wherein the first and second fields are substantially co-axial.

16. (Original) A method according to claim 15 wherein the first and second fields are substantially co-axial with plasma emitted from the arc.


Claims 17-25 (Cancelled)



26. (New) A method of depositing carbon ions from a cathode target onto a substrate in a vacuum chamber, comprising the steps of:

- (i) generating (a) below the target, a first magnetic field having a first field direction and (b) above the target, a second magnetic field having a second field direction opposite to that of the first, so as to generate a magnetic field that is resultant from the first and second fields, wherein said magnetic field has a direction substantially normal to a front surface of the target and zero field strength at a position above the target and inside the chamber;
- (ii) striking an arc in the resultant field; and
- (iii) depositing carbon ions onto the substrate.

27. (New) The method of Claim 26 wherein the step of generating the first and second magnetic fields comprises the step of varying coil current in means for



generating the first or second magnetic fields so as to vary the resultant field to optimize arc striking.

28. (New) The method of Claim 26 further comprising the step of using the second magnetic field to steer plasma from the arc through a macroparticle filter.

This listing of claims will replace all prior versions, and listings of claims in the application.